JPRS-CST-93-003
2 March 1993

FOREIGN BROADCAST INFORMATION SERVICE

JPRS Report

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China Implements Technology Research Center Construction Plan

93FE0315B Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 8 Dec 92 p 1

[Article by Ma Qinwu [7456 0530 2976]: "China Implements Technology Research Centers Plan To Promote Transferring of Science and Technology Achievements, and To Improve Industrial Competitiveness"]

[Text] Based on China's experiences in planning for science and technology (S&T) development in the last decade, and the need of instituting China's socialized market economy, the State Planning Commission (SPC) has officially formulated a plan to implement National Technology Research Centers (NTRC) to speed up the transfer of S&T achievements to production; to promote the integration of economy and S&T, as well as the integration of research institutes and enterprises; and eventually to strengthen the industrial competitiveness of China.

Beginning in 1988, on the basis of instituting the plan to tackle China's key S&T problems and the plan for China's key industrial experimentations, SPC, relying on the nation's major institutes and colleges, has selected seven meritorious items to launch the establishment of NTRC's test projects to strengthen the weak link of technologizing the research achievements. These centers are: the CAS Shanghai Microelectronics Engineering Research Center, MMEI's Beijing Large-Scale Integrated Circuit CAD Research Center, the Semiconductor Basic Materials Technology Research Center of the China Non-Ferrous Metals Institute, the Industrial Automation Technology Research Center of Zhejiang University, the Optical Communications Technology Research Center of Wuhan Posts and Telecommunications Research Institute, the Dyestuff Technology Research Center of Shenyang Chemical Engineering Institute, and the Optoelectronic Device Technology Research Center of CAS. The total investment in these seven items will amount to around 300 million yuan and will be borne by the SPC, other concerned departments and the organizations undertaking the projects.

Through preliminary practice and repeated adjustments and studies, SPC will implement the NTRC construction plan during the Eighth 5-Year Plan. NTRC will conduct research on the systematic integration of key technologies and general technologies, on technology industrialization for China's industrial development, as well as on the realization of transferring the S&T achievements to markets or enterprises. NTRC's missions are: first, to carry out the systematic integration of key technologies and general technologies and their industrialization during industrial development; second, the introduction, digestion, absorption and then improvement of advanced technologies and applied technologies; and third, the cultivation of high-quality technological personnel to provide information and consultation services for industrial development.

The plan's preliminary goals during the Eighth 5-Year Plan and the early Ninth 5-Year Plan as decided by SPC are as follows: By unifying a few hundred large- and medium-sized enterprises or a few dozen large conglomerates, a group of technology research centers will be established among China's concerned research organizations, enterprises, and universities. The centers, supported by enterprises and government, will become a strong S&T achievement conversion force. Based on market demands, a few hundred important research achievements will be transferred to industries every year. To ensure the implementation of this plan, SPC, through policy and investment guidance, will make both the enterprises and the concerned organizations participate in the NTRC construction. SPC will mobilize the necessary capital to carry on the work. Overall, the ratio of government investment to the combined capital of concerned departments, enterprises, and construction units will be about 1:1. These technology research centers will be completed in 1997. Their functions mainly fall in the fields of electronic information technology and its application, chemical engineering, new materials, and high-efficiency energy utilization, as well as environmental protection.

In the formulation and the organization of the NTRC plan, SPC adopted the principle of "expert evaluation, selection of the best through competition, and the SPC summation for balance." The selection and evaluation of the NTRC projects will be entrusted to experts, and research will proceed according to pertinent guidelines and scope.

Basic Research Significant to National Defense Policymaking

93FE0315A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 4 Dec 92 p 6

[Article by He Zuoxiu [0149 4373 1652]: "Importance of Basic Research as Revealed From Policy Decisions of 'Missile and Bomb' Development"]

[Text] The experience of China's defense build-up has proven that "winning the basic research battle" is the prerequisite for building up national defense, because theories often affect policy decisions, especially crucial policy decisions.

For example, as early as 1955, the important decision to be made was which air-defense course China should adopt to strengthen national defense. Naturally the idea was to develop defense aircraft, but from a deeper theoretical point of view, China needed guided missiles first. Missiles are superior to airplanes for both offense and defense, as they have much higher Mach numbers (higher speed) than airplanes. However, at that time the first satellite of the former USSR had not been launched, the experiment of intercontinental ballistic missile had not succeeded yet, and there was no consensus as to whether missile technology could become the reality of defense technology. China was then backward in science

and technology (S&T) and unable to develop missile technology. Whether China might possibly make a strategic policy mistake was the great problem.

At that time, Professor Qian Xuesen, fresh from abroad, prevailed over all dissenting views and pointed out that China should develop missiles, for the significant reason that to master and develop missile or rocket technology was not necessarily more difficult than developing aircraft. The missile materials would be used only once while the airplane materials would require repeated uses, hence, the aircraft engine and other structures demanded specific materials. This materials development that required a long period of cumulated experiences could be ignored if China had decided to develop missiles. The only problem of missile development was guidance. A breakthrough on guidance could be achieved within a short period of time. In addition, the Chinese people are intelligent. The important policy decision that China should develop guided missiles was based on the theoretical analysis of China's internal conditions and the prospect of international technological development.

In August 1992, China launched a 7-ton Australian satellite into orbit. The news elated the whole nation. It was exactly the outcome of the policy made during 1955 and 1956. In retrospect, the success of this important policy owes to the prediction that a breakthrough of the guidance problem could be resolved in a short period of time.

There is another example involving policymaking on the most advanced defense technology. In 1955, China decided to develop atomic energy, i.e., to build atomic bombs. Which technological route should China follow? Should it be developing Pu^{239}? Or U^{235}? Or U^{233}? It was easy to rule out U^{233} which would involve the thorium industry, hence, both the uranium system and the thorium system would be involved. At that time China could only work on one system. In the uranium system, there were also two technologies: producing Pu^{239} from a reactor, or developing the method of producing U^{235} through isotope separation. At first glance, the method of separating Pu^{239} from the mixed system of uranium and plutonium would be much easier than the method of separating U^{235} from the mixed system of U^{235} and U^{238}, because the former used chemical separation and the latter, physical separation. Meticulous research indicated that as far as separation was concerned, chemical separation should be easier than physical separation. However, technologically, separation of plutonium and uranium was not very easy due to the high radioactivity of the Pu-U system, and the severe toxicity of plutonium. To ensure workers' safety, the cleanup technology would be difficult, moreover, it would take a long time to cool down the radioactivity. Therefore, the best choice should be the separation of U^{235} and U^{238} isotopes to speed up the atomic industry.

Furthermore, technical publications at the time indicated that there were two methods to detonate an atomic bomb: one was called the "gun-barrel" method which detonated the bomb by closing up quickly two U^{235} hemispheres together; the other was called the "implosion" method which detonated the bomb by using dynamite explosion to quickly shrink the size of a Pu^{239} sphere. The implosion method was considered more technically advanced, and it would detonate the bomb with higher destructive power than the gun-barrel method. The problem was whether China was capable of producing a uranium bomb detonated by the implosion method. It was an unknown factor to the Chinese people at that time! However, the theoretical physicists in the Ministry of Nuclear Industry worked together and concluded that theoretically it was entirely possible to detonate a U^{235} bomb through implosion. The participating theoreticians recalled that should the theoretical research have wavered then, the complete industry structure would have to be redeployed. Therefore, the course of atomic energy development has further proven: win the theoretical war first!

The "missile and bomb" problems were resolved through the cooperation of many scientists and technologists, workers, officers and men of the People's Liberation Army, political workers, logistical workers, as well as leading cadres. Nevertheless, tracing back to the route of success, the foremost breakthrough was the winning of the theoretical battle. "Winning the theoretical battle" is not only the conclusion from experiences in developing the most advanced defense technology but also the important principle that must be considered in building up China's economy.

Accelerating Reform of R&D Institutes for National Defense Urged

93FE0286B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 30 Nov 92 p 3

[Article by Armaments Industry Corporation Deputy Office Chief, Wu Shanggui [2976 1424 6311]]

[Text] The 14th National Party Congress clearly promotes the establishment of a socialist market economy system, which has interested the great majority of China's scientific organizations into converting from utility organizations to management organizations in keeping with the new dynamic mechanism of the market economy system. Most of China's military industry R&D institutes are still of the 1960s, locked into the former Soviet model, and still hanging on to the framework of the planned economic system, subordinate to the compartmented ministerial scientific research system, which obviously is not compatible with the needs of today's national defense scientific research structure and the market economy. There are many drawbacks to that kind of scientific research system:

1. Secular specialized organizations, and S&T and economics are "cuts of different hides". The scientific research academies and institutes of China's military industries are singular military entities whose main duty is toward the "military battlefield", and the research and

manufacture of new armaments for military units. Now, the mission of the military industry's scientific research academies and institutes has changed from being mainly for the "military battlefield" to being simultaneously directed at the "economic construction battlefield". The thought processes of the specialized secular organizations of the military industry scientific research institutes cannot change on the spot, and in a rather short period military industry S&T and economic construction have become cuts of different hides.

2. Huge organizations and units, "Large temple, lots of saints" and "Many monks, little porridge", reduces the military industrial R&D to self subsistence and tough going. In the past, this enormous military industrial S&T outfit was raised and nourished from "The emperor's pantry". In form, its administrative structure was multi-layered, irrespective of the size or authorized strength of institutes. The staff and workers reclined and fed on the corpus of the institute, and the institutes reclined and fed on the corpus of the country. Their assignments were passed down from above, funds and materials were handed down from the state; the state took care of everything. And so things have gone on for some time, and a mentality of dependency—"wait, lean, and want"—evolved. When state scientific research dwindled it was tough going for the military industry academies and institutes to subsist and develop.

3. The talent drain is serious, the talent structure is not rational, and the experience structure is deformed; small at the top and bottom, and fat in the middle. Generally speaking, the best shape for a stable and rational experience structure is a "pyramid". A study of 29 specialized institutes in the armaments industry showed that high-grade professionals make up 14.6 percent, middle level professionals 43.7 percent, and beginning professionals 41.7 percent. The reason for this distorted structure, besides the specialized technical positions appointment system itself being less than perfect, and selection controls for appointments to high-grade technical positions index now being defunct, is that a fair amount of defense industry institutes are located in third line areas where conditions are backward, and the loss rate for university graduates assigned to those areas is over 30 percent.

To deal with these problems, and to seize the present opportunity to further bring to fruition the spirit of the 14th National Party Congress, and step up the pace of reform in China's military industry S&T system, the following reform measures should be taken:

1. Implement a new dynamic mechanism of "integrating the military and the people" and "one institute, two systems". In the leadership system, the command administration, plans & programs, and even in the S&T elements of the military industry academy and institutes, the principle of "One divided into two" should be put into effect. For military products R&D the directive planning and administrative mechanism should remain in effect. The development of civilian products should be directed toward the market. A principle of "Hold on to what is critical (military R&D), let the other loose" (civilian product development) should be final. The arms industry, for example, at present has a total military products output value of only 30 percent of the total value of production output. In order to accelerate the pace of the reform for "protecting what is critical, and letting the other go the limit", the practice of "storing water to raise fish" should be pursued. Keep on with the 30 percent core of military products R&D geared toward the "military battlefield" and the research and manufacture of advanced weapons and facilities for military units; and let the other 70 percent of the S&T talent "open the flood gates and let the fish go to the sea", and engage in the economic construction battlefield.

2. "Take down the temple and disperse the saints", erect a "small booth, high level" military industrial R&D organization. First, dismantle and compress the unnecessary multi-layered administrative technical office orginizations, and reduce the administrative and odd-jobs ratio. Then, to resolve the "many monks, little porridge" conflict, the government should greatly increase investment in military industry R&D, and not allow the longstanding "half starved" armaments research institutes situation to continue. And third, since it is evident that the administrative expenses are already very limited, they will surely be unable to support a large military industrial academy and large institutes. The principles of "everything for the people" and "operating expenses according to number of people" as applied to military industrial scientists and technicians should be redirected toward subsidizing the maintenance of military product S&T, raising investments in military products R&D, and guaranteeing a sustained, stable, and coordinated development of the national defense R&D.

3. Make a well managed "deployment of talent" one of the long range strategies for reform of the military industry R&D system. Deployment and adjustment, gradual improvment of the structure, and rational deployment will be helpful for "maintaining the military and transforming the people", and developing the military industry S&T system of the commercial economy. Especially with respect to the military industrial scientists and technicians in the backward environments of the third line, in order to ensure the completion of major military R&D projects for national security, there is a need to raise the wage level on a large scale and to implement key protective policies. And, preferential policies should be formulated and perfected to attract S&T talent to the remote third line areas, and to prevent and negate this sort of disregard for national interests and "contrary" interest in seeking only personal gain in rejecting third line area assignments. And again, there must be a strengthening of spirited cultural construction, and a stronger and more stable military industry S&T force in remote areas. Scientists and technicians must accept their selection and assignment in the interest of the Party and the country, and as the country needs to send them to remote and backward areas to work they should blend their intelligence and wisdom into socialist modernization and construction.

Eight Cities Chosen To Be Testing Points for S&T-Economy Parallel Reform

93FE0286C Yinchuan NINGXIA RIBAO in Chinese 11 Nov 92 p 2

[Text] The State Science and Technology Commission and the State Commission for Restructuring the Economy recently decided to select eight cities—Shenyang, Nanjing, Harbin, Huangshi, Guangzhou, Dalian, Yantai, and Chongqing—to be test point markets to carry out, in the Eighth 5-Year Plan, the S&T-Economic system test points, to explore further restructuring and building of the road to a socialist market economy.

The State Science and Technology Commission and the State Commission for Restructuring the Economy foresee that the Eighth 5-Year Plan S&T-economic parallel system reform test points will, on the foundation of the Seventh 5-Year Plan, aim to unleash S&T production, direct S&T endeavors toward economic construction and make economic construction reliant on S&T; will cultivate and develop commodity markets, service markets, and technical markets, and establish an unimpeded orderly market system on a sound scale, a market system that fully empowers the law of values and such economic laws; and will create a new format which will be a of singular embodiment of urban and rural science, technology and economics.

There are eight aspects to the main mission of the test points:

—Encourage a distribution of S&T talent, adjust S&T units and organizations, actively develop S&T enterprises;

—Accelerate the restructuring of the economic system to one in which enterprise management is central, accelerate the growth and development of the market system and create environments for S&T progress;

—Accelerate the conversion of S&T products into real production strength, promote commercialization, industrialization, and internationalization of high-tech products, and use of S&T, and especially high technology, to transform traditional industries;

—Bring S&T directly into the agricultural economy, rely on great S&T to develop great agriculture, and push for a coordinated development of the urban and rural S&T-economy;

—Establish multi-source, multi-level S&T input throughout the society, and guarantee S&T input has a sustained and steady growth;

—Effect a step by step S&T personnel policy, fully developing S&T personnel talent and knowledge;

—Open up to the outside on a multi-faceted multi-level broad-based scale, and push for international S&T cooperation and an outreaching economic development;

—Perfect an S&T policy and legal system, and create excellent environments and conditions to support development.

Zhou Guangzhao: CAS to Participate in Market Competition

93FE0286A Beijing RENMIN RIBAO in Chinese 24 Nov 92 p 4

[Article by reporter Wen Hongyen [3306 4767 1750]]

[Text] The CAS held its 1993 Working Conference in Beijing on the afternoon of 24 November. CAS President, Zhou Guangzhao, gave a work report at the opening ceremony asking the Academy members to free up their thinking, change their mentality, and in keeping with the socialist market economic system, accelerate the pace of reform, and join in the market competition. He said the future development goals of CAS should be to have a line of international standard institutes, to form certain science centers and engineering research centers, set up excellent high-tech enterprise groups, and have an academic department made up of academic committee members selected from among the best scientists in China.

Summing up the CAS reform experience, Zhou Guangzhao proposed that the Academy implement the "One Academy, two dynamic mechanisms" idea, and by this example develop various kinds of research operation policies.

He said the time of holding out hands to the Academy and asking for money, people, and materials has passed. The institutes must become legal entities with independent initiative, and be organized and actively competitive elements. They must do in-depth investigative research, take pains to get organized, and they should not be scheming for opportunity, blindly following along, gullible and retiring.

In the work report, Zhou Guangzhao expressed his opinions on present reforms of the CAS institutes' basic research, natural resources ecological environment efforts, developmental work, organizational restructuring, nurturing of young talent, and political thought. He said the essence of institutional restructuring is to provide the institutes, as far as possible, with all of the conditions necessary to become competitive as basic independent entities in the market economy, and raise the research institutes' initiative and management capability. The Academy is mainly a macro-manager of the institutes responsible for: 1. providing a foundation for goal responsibility, passing full-scale reforms, and establishing an integrated relationship among the Academy and the institutes; 2. improving support for selection and quality, and strengthening research on the goal appraisal system for institutes; 3. strengthening leadership groups for institutes and stepping up the restructuring of the personnel system.

In addressing developmental work, Zhou Guangzhao called for more open thinking: Based on the original situation and the findings of the recent capital consolidation study, a management objective responsibility system should be implemented, internal incentive mechanisms should be established, a corporate culture should be cultivated, and unit cohesiveness should be improved. The opportunity should be seized to select out academy-administered institution-run corporations with many economic merits, high S&T content, and standardized management practices and give them sound support, and strive to form, within 3 to 5 years, a line of enterprises with annual output values in excess of 100 million yuan. These well-endowed institutes and corporations must, on well-reasoned bases, seek excellent mutually supportive, mutually beneficial, and mutually profitable partnerships, be attractive to foreign funding, and develop joint ventures.

Zhou Guangzhao said it is also one of the Academy's goals to form academic groups from the academic department committee members. They will be representative of the nation's best scientists, and the academic department committee members will give counsel on the country's major issues, assist in formulating the S&T policy for the country, raise the overall reputation and position of scientific circles in the society. If these goals are realized, the CAS will become a genuine national people's and national scientists' academy, will achieve a very high level of science, and make endless contributions to the nation.

Aeronautical and Astronautical Foreign Trade Base To Be Built in Pudong

93FE0288d Shanghai WEN HUI BAO in Chinese 7 Nov 92 p 1

[Article by reporter Chen Wei [7115 1919] and correspondent Zhong Zhiping [6988 1807 1627]]

[Text] On 6 November, the Ministry of Aeronautics and Astronautics Industry's Shanghai Astronautics Industry (Group) Corporation, China Jiangnan Astronautics Industry Group Corporation, Shenyang Aircraft Manufacturing Corporation, Xian Aircraft Industry Corporation, Harbin Aircraft Manufacturing Corporation, Shenyang Liming Engine Manufacturing Corporation, Shanghai Landline Factory, Shanghai Xinli Machinery Factory, and Shanghai Automobile Control Devices Factory, at the Shanghai Waigaoqiao Tax-Sheltered Zone Joint Development Corporation, separately signed a contract for transfer of rights for 128 mu of land. In January and March, the China Aero-Technology Import Export Corporation, China Great Wall Industrial Corporation, China Precisioned Machinery Import Export Corporation, Shanghai Astronautics Industry Corporation, Harbin Dongan Engine Manufacturing Corporation, at the Shanghai Waigaoqiao Tax-Shelter Zone Development Corporation, had previously signed a transfer of rights contract for 101 mu of land. It is estimated that within 5 years the Ministry of Aeronautics and Astronautics will invest over 1 billion yuan in the development of Pudong.

The Ministry of Aeronautics and Astronautics actively responded to the Party Central Committee's call to "Develop Pudong, Open up Pudong", and began from May last year to get actively involved in the development of Pudong. While the land-use rights were being processed, over ten corporations were set up and others will follow soon. It is estimated that after 2 or 3 years, a new Aeronautics and Astronautics Foreign Trade Base will rise up inside the Tax-Shelter Zone.

The Ministry will rent out or take over the use of the other spaces inside the Pudong New Zone—some enterprises have already opened up operations—and in this way, the Ministry will rent or use altogether over 500 mu of land.

Vice Ministers of the Ministry of Aeronautics and Astronautics, Zhu Yuli and Wang Liheng, and the Vice Mayor of Shanghai, Gu Chuanxun, attended the signing ceremony.

CAS Goal: Establishing International Standard Research Organizations

93FE0288C Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 24 Nov 92 p 3

[Article by reporter Yang Lianghua [2799 5328 0553]]

[Text] After 9 years of successful reforms and the impact of further accelerated reforms, what will CAS goals be, and what form will CAS take in the future under the socialist market economy system? At a CAS Working Conference on 24 November, CAS President, Zhou Guangzhao, depicted the future prospects as follows:

Through reform the CAS should have a line of international standard research institutes, and establish a number of science centers and engineering research centers. Surrounding him were high-tech enterprise teams composed of participants from CAS and other research institutes set up as legal entities, but with close ties to research institutes, and they engage in constant two-way exchanges on matters of funding, talent, information, and achievements.

The whole CAS system is fully open to outside circles, and it can manage joint ventures, build and open up laboratories with high level colleges, build industrial laboratories jointly with enterprises, and can operate research organizations locally, and maintain close relationships in various social circles. CAS personnel also want constant interchange with the outside, to nurture and absorb excellent youths into the heart of S&T units, and support and organize excellent technicians into lines of research; and after gaining experience and achieving results, to constantly move them into various endeavors in all facets of society. CAS needs to become deeply

rooted in all facets of society, and therefrom, organize and develop well skilled advanced units of Chinese scientists and technicians.

Through its superlative technical authority, CAS will continue to hold counsel on great national issues, assist in setting up nationwide S&T policies, and raise its overall prestige, position, and power to speak in society.

Zhou Guangzhao expressed his desire to make CAS a science academy for all the people and scientists of China, to have a high science standard, make great and unending contributions to the country, and follow a unique course of development in accordance with national conditions. Zhou Guangzhao also expressed his desire to work hard in the struggle to get China's scientific research organizations to prepare for the occasion of its 100th anniversary, and around the second decade of the next century, to foster from within the Chinese research organization, a Nobel Prize-winning Chinese scientist.

China Calls for Halt to Outer Space Military Competition

93FE0288B Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 12 Nov 92 p 6

[Text] On 10 November at the 47th session of the First Committee of the [World Disarmament Conference of the] U.N. General Assembly, Chinese representative, Wu Chengjiang, urged the international community to stop outer space military competition, calling for a complete prohibition against and destruction of outer space weapons.

He said that all nations that possess an outer space military capability should immediately adopt measures to prevent and halt outer space military competition. Nations that have the largest outer space military capability have a special responsibility to stop the development, testing, production and deployment of outer space weapons, and should destroy all existing outer space weapons.

Wu Chengjiang called on the international community to adopt measures for a preemptive total prohibition against all types of outer space weapons, and to prohibit utilization of weapons and hostile actions into and from outer space. He also urged the World Disarmament Conference to engage in substantive talks on this matter, and reach international accord as early as possible.

He also said that China and other concerned nations, based on the above stated positions, have drawn up a draft resolution on the issue of "Preventing Outer Space Military Competition", and have delivered it to the current session of the First Committee of the United Nations World Disarmament Conference.

Enhancing Military S&T Propaganda Urged

93FE0288A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 29 Oct 92 p 2

[Article by reporters Wang Hanlin [3769 5062 2651] and Fan Li [4336 0500]]

[Text] On the afternoon of 23 October the SCIENCE AND TECHNOLOGY DAILY invited officials of the three PLA General Departments, and the propaganda departments and bureaus of the Commission of Science, Technology and Industry for National Defense, the PLA Navy, Air Force, and Second Artillery Corps to discuss and examine their perceptions in carrying out the spirit of the 14th National Party Congress, and to study raising scientific propaganda to a higher level.

Accredited official participants by possession of the S&T Daily's "Call for papers on military S&T", the representatives of the three PLA General Departments and various military propaganda departments, attended the symposium. In their statements they proclaimed the 14th National Party Congress yet another milestone in the history of the Party. Deng Xiaoping's thesis, "S&T is the primary power of production", was clearly written into the report of the 14th National Party Congress, and it made vigorous development of S&T one of China's ten primary missions for the 1990s. The long-range goal for the PLA is to build a quality army vitalized by S&T, and strengthening military S&T propaganda is the news service's important mission of the times.

The Director of the Naval Political Propaganda Department, Huang Daipei, said the 14th National Party Congress has declared that economic construction must be the key to stimulating an even greater development of China's economy. The military must raise its combat strength and become a quality-built military, and therefore must rely on S&T. Propagandizing the employment of S&T in military operations, and raising the S&T conscientiousness of officers and men will be the main content of military S&T propaganda.

Chief of the General Staff Propaganda Department, Lin Jianchao [2651 1696 6389], said that rapid development of Chinese S&T has brought profound changes to the PLA. Chief of the General Staff, Chi Haotian [6688 3185 3944], at a recent meeting of the cadres of the PLA and above, called on all PLA cadres to study S&T, to push for high-tech development throughout the PLA, and to increase the role of S&T in all aspects of education and training. Military S&T propaganda must take a leading role in this, and must be the tie that binds S&T to military operations.

The S&T Daily and the Military Supplies and Armaments Research Institute of the General Logistics Department co-authored the "Call for papers on military S&T", and they compiled a massive report on the application of S&T in military operations.

The Deputy Director of the General Political Propaganda Bureau, Zhu Yuanyuan [2612 86 73 0337], said that propagandizing for military S&T is a tradition of the S&T DAILY, but this sort of competitive action group in a military S&T context is a nationwide first. This is a massive report on military S&T from top to bottom. Using this form to focus the military information service's attention on S&T propaganda is an excellent approach. He called for an earnest summing up of the experience of this contest, and more work on the depth and range of the military S&T report.

The Deputy Director of the General Logistics Propaganda Department, Zhang Liuxin [7022 0491 2946], the Deputy Director of the Commission of Science, Technology and Industry for National Defense, Wang Xuntong [3769 7311 6639, Director of the PLA Air Force Propaganda Department, Wang Jiyun [3769 4949 7189], and Director of the Second Artillery Corps Propaganda Department, Zhao Huanan [6392 0553 0589], also gave speeches at the conference.

The Director and Editor in Chief of the S&T DAILY, Lin Yushu, expressed his gratitude for the support and assistance given the S&T DAILY by the three PLA General Departments and various military elements. Looking back on the years of military support for the S&T propaganda effort, he said the S&T DAILY, first published in 1986, established a military political group in the news department, the only one of its kind among local newspapers. In those years, the S&T DAILY reported and processed a line news items on military units, and in the last year alone has printed 310 military unit articles in the paper. In recent years, the paper has focused on key military S&T activities at all times, and covered many timely and in-depth reports on special topics, and also featured long reports on advanced group and individual achievements in military unit S&T systems. During the last year alone, 28 items on group achievements, 97 individual, and over 140 new achievements were reported and they have made a great impression on the society. Lin Yushu said China must earnestly carry through the spirit of the 14th National Party Congress, should put forth a huge effort into in-depth reporting on military S&T from top to bottom, and strive to get in step with military propaganda people to raise military S&T propaganda to a new level.

Jiuquan Satellite Launch Center Detailed

93FE0219A Beijing ZHONGGUO HANGTIAN [AEROSPACE CHINA] in Chinese No 11, Nov 92 pp 38-42

[Article by Li Fengzhou [2621 7364 3166], chief engineer, JSLC: "Western China's Developing Space City: Jiuquan Satellite Launch Center"]

[Text] **Abstract**

Jiuquan Satellite Launch Center (JSLC) is the first satellite site built in China. Its location has a unique geographic advantage; it has a complete test and launch system, high-accuracy tracking and measurement equipment, and advanced command, control, and computer system with compatible support facilities. In order to accommodate the growing demand for space launches and to provide various technical services, JSLC is currently undergoing renovation and reconstruction.

Built in 1958, the Jiuquan Satellite Launch Center (JSLC) has been in operation for 34 years with internationally recognized achievements. Here is where China's first satellite was launched and China's first- generation strategic missiles were tested; up to October 1992, this site supported the launches and recoveries of 14 remote-sensing satellites with a 100 percent success rate. Since 1979, one after another foreign delegations have visited JSLC; in 1987, JSLC began satellite launch service for foreign clients. For example, in August 1987 and August 1988, JSLC launched microgravity test platforms into space and successfully recovered them for the French Matra Co. and the German MBB Co., respectively; on 6 October of this year, a Swedish scientific experimental satellite was also launched into space.

In an effort to accommodate increasing satellite launch business from abroad, JSLC has been undergoing renovation and new construction since the late 1980's, and the Space City is also undergoing expansion and development. A brief description of the JSLC facility is given below.

I. Geographic Location and Unique Features of the Geography and Climate

JSLC is located in the Ejin Qi autonomous region in Inner Mongolia; its headquarters is located in Huxi Village, whose geographic coordinates are 41°N latitude and 100°E longitude. It borders the Juyan Basin to the north, the Badain Jaran Desert in the east, the Mazong Mountain Range to the west, and the Jiuquan region of Gansu Province to the south. Its terrain slopes from south to north with an average elevation of 1,000 m. The Ruo Shui River passes through the launch center from south to north; it provides a rich and high quality underground water source. Within an area extending 50 km north-south and 300 km east-west, the population is sparse and the terrain is open, flat and mostly desert.

Under the influence of high-altitude jet streams, the Launch Center has a typical continental climate: cold winters, dry and hot summers, and short springs and autumns with intense sunlight. There are more than 320 days per year in which conditions are suitable for launch (defined to be the conditions where during a contiguous 4-hour period, the number of clouds is less than 3, the wind speed is less than 8 m/s, and the visibility is greater than 20 km); the annual mean relative humidity is 37 percent. These unique climate conditions make it easy for launch-window selection and therefore provide a favorable environment for launching satellites.

II. Facilities and Equipment at the Launch Center

The JSLC is part of the China Satellite Launch, Tracking and Control System Department. Its current mission is to launch high-inclination, mid- and low-altitude experimental satellites and application satellites using the Long March family of launch vehicles.

The JSLC components include the test and launch unit, the measurement and communications unit, the command and control unit, and the service and support unit. They are distributed within a narrow area along both shores of the Ruo Shui River centered around Huxi Village.

1. The Test and Launch Unit

The test and launch unit is distributed at the test and technical center and the launch site. The test and technical center is located 18 km north of Huxi Village; the two main buildings at the center are the launch-vehicle assembly building and the satellite assembly building, designated as BL1 and BL2. In 1991, a new payload test and assembly building was also completed. BL1 and BL2 have a total area of 9,600 m^2; each building has basically the same interior design and layout, and each can accommodate the testing and assembly of two launch vehicles and several satellites at the same time. For example, BL1 is 140 m long; its assembly hall is 90 m long and 18 m wide, and is equipped with a twin-beam, dual-speed bridge structure for lifting operations. The main and auxiliary hooks can operate at a velocity ranging from 0.9 m/min to 5.4 m/min, and have a span of 16.5 m. Two rail sections installed on the floor inside the assembly hall are connected to the outside rail line. There are 25 test chambers on both sides of the hall; the test chambers used for payload inspection and assembly have a cleanliness rating of higher than 100,000; other chambers have cleanliness ratings of over 300,000. Every chamber is equipped with anti-static measures and all electric switches and lighting units are equipped with spark-suppression devices. When a new product is being assembled and tested, the test data from the subsystems are sent to the control room of the test and technical center to be analyzed. In order to satisfy the needs of routine testing, each chamber is equipped with special test facilities and instruments such as vibration table, rocking table, gyro detection table, etc.

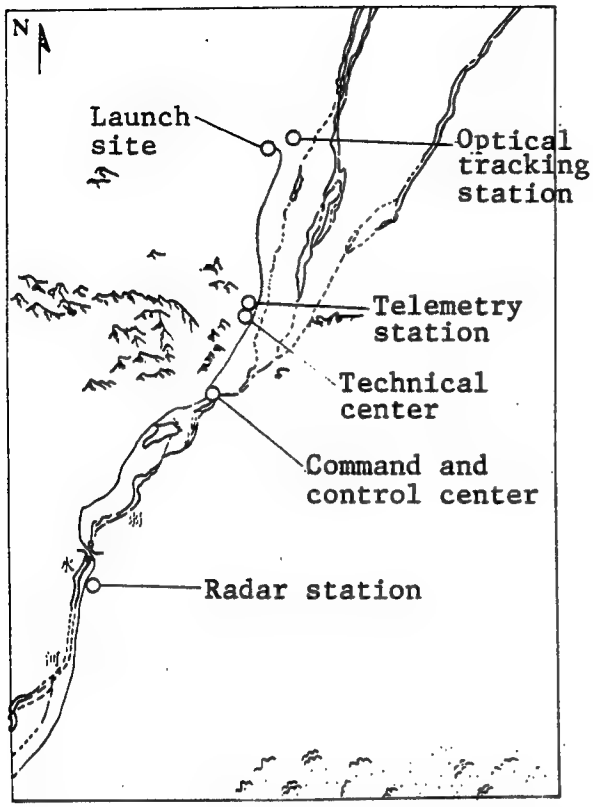

Figure 1. Layout of the Jiuquan Satellite Launch Center

The launch site is located approximately 30 km north of the test and technical center; it has two launch stations separated by 416 m. Both stations operate with a fixed umbilical tower; each tower is 41.6 m tall and has 11 fixed platforms and a number of mobile platforms. Platform height can be adjusted according to need. The service tower shared by the two stations is 55 m tall, 30.5 m long and 20.9 m wide, with a rail distance of 17 m and a base distance of 22 m; it has two operating speeds: 15 m/min and 3 m/min. The main hook of the hoist mechanism has a lift capability of 15 tons and the auxiliary hook has a lift capability of 5 tons. The top section of the service tower has a sealed compartment which can be used for testing and inspecting instrument units of the satellites or the launch vehicles. The sealed compartment is 6 m long, 6.5 m wide and 13.1 m tall, and is situated 29.3-42.4 m above the ground; its temperature is within the range 20° +/- 5°C, its humidity is within 50 percent-70 percent, and it has a cleanliness rating of 100,000.

The launch platform can support launch operations for any of the Long March family of launch vehicles with the following adjustments: 200 mm in height adjustment, +/- 180° in turn angle and 2.5 deg/min in turn velocity adjustments with an accuracy of 5 min.

Located 200 m from the launch station is a semi-underground launch control room equipped with advanced monitoring, control and command systems (see Figure 3). These systems are designed to transmit the pictures taken by color television cameras installed at various locations in the umbilical tower to the commanders in the control room. They also transmit data collected by the sensors to the computer in the launch control room, and the control commands to the corresponding executive mechanism; the results of executive actions are then fed back to the control room. After lift-off, the measured telemetry data are processed in real time by the computer, and the computed orbit parameters are sent back to the launch control room and to the commanders at the launch site.

A special monitor room equipped with the proper instruments is made available for foreign visitors to inspect their own products prior to launch and to understand the necessary real-time data and other information during flight.

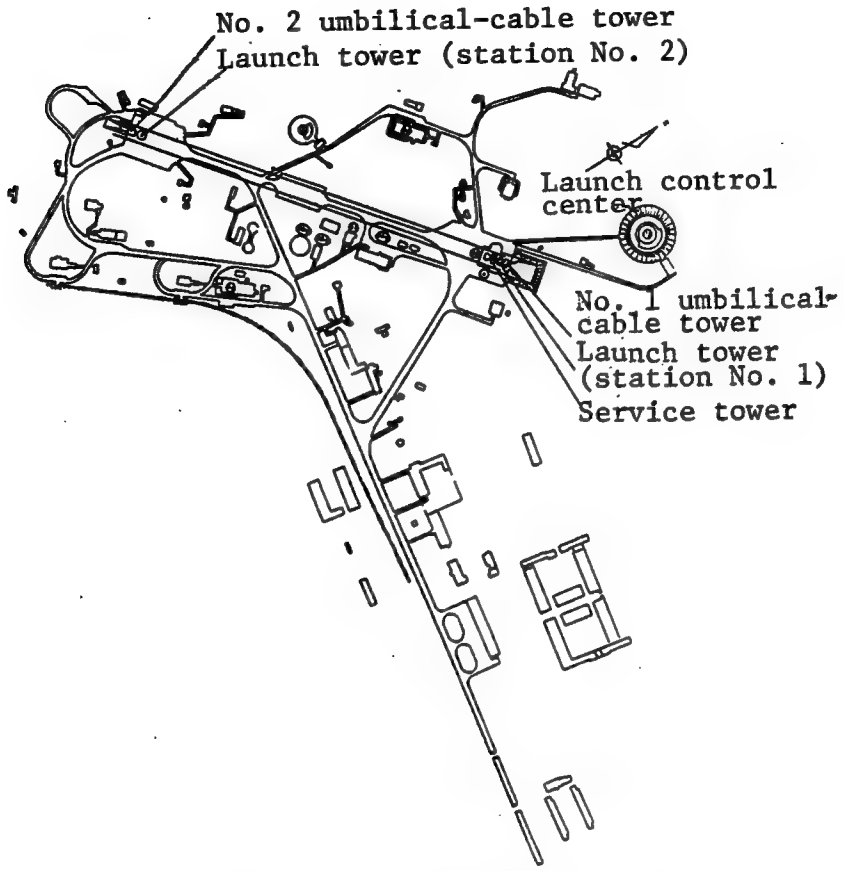

Figure 2. Layout of the Jiuquan Launch Site

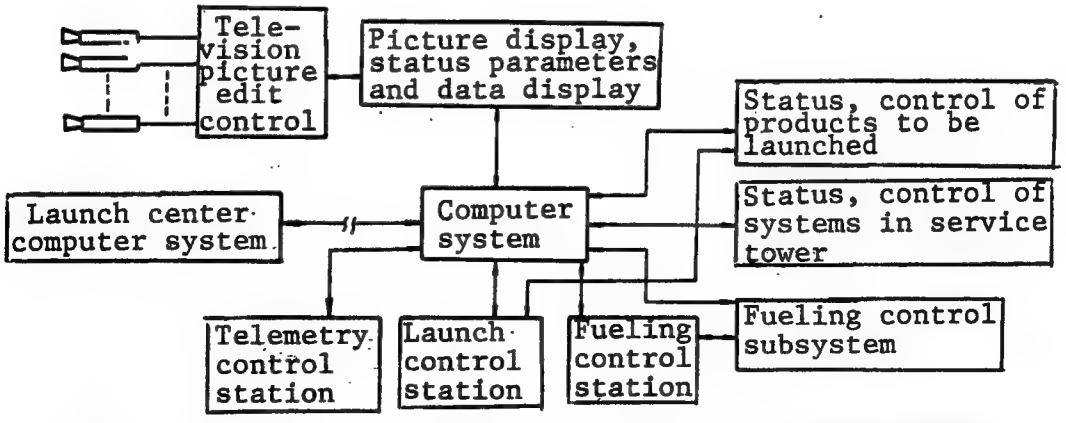

Figure 3. Functional Diagram of Data Collection and Control at the Jiuquan Launch Site

2. Tracking Measurement System and Computation Control Center

In order to ensure injection of the satellite into the designated orbit, JSLC performs the functions of telemetry monitoring and measurement during the initial segment of the trajectory after lift-off and during the powered-flight segment. For this reason, multi-function and multi-coverage tracking and measurement equipment are installed at the Launch Center. As soon as the rocket leaves the tower after ignition, multiple high-speed cameras are activated to take pictures of the lift-off from different angles, and to collect data on drift of the launch vehicle during its vertical ascent. During the initial flight segment, optical sensors are used for tracking and measurement. A high-precision long-baseline interferometry system and a monopulse tracking radar are also used for position and velocity measurements. In addition, high-bit-rate telemetry systems are used to perform real-time recording of various rocket parameters during the flight.

The measured optical, telemetry and radar data are transmitted in real time to the computation and control center located at Huxi Village, where they are processed by the multi-computer real-time processing system to obtain orbit parameters, timing command parameters and status parameters. These parameters are classified, displayed, printed and sent to different stations of the launch site; at the same time, they are sent to the Satellite Launch and Tracking Control Center in Beijing and the Xian Satellite Tracking Control Center via the satellite communications network (see Figure 6) [photographs, Figures 4 and 5, not reproduced].

After lift-off, JSLC's next task is to process and analyze the collected data and to estimate the accuracy of the tracking and measurement system. Within a certain time limit after the launch, a report will be issued which contains the results of the accuracy analysis and the corresponding tables and curves. During this period, JSLC continues to perform tracking and measurement functions for other Chinese-launched recoverable satellites. After more than 30 years of operation, JSLC has established the following ground rules for a successful launch mission: (1) launch on schedule; (2) collect a complete set of optical, telemetry and radar data; and (3) document accuracy analysis results and issue reports in a timely manner.

3. Support System

As part of the communications system, fiber-optic cables have been installed between Huxi Village and the test and technical center, the launch site, the tracking and measurement stations, and the satellite communications ground stations to facilitate high-bit-rate data transmission and real-time picture transmission. To provide communications for on-site foreign customers with the outside world, stored-program-controlled telephone service and facsimile service are available at Huxi Village and the test and technical center. A highly accurate timing service provides the time reference and synchronization for the entire launch center; the synchronization accuracy is of the order of microseconds.

The meteorological center has the capability of making short-term, medium-term or long-term weather forecasts as well as data and statistical forecasts. The newly renovated rain (cloud) measurement radar has the capability of measuring the distribution of rain storms and the direction of cloud movement. The satellite cloud-map receiving unit can record one cloud map per hour. In order to obtain data on index of refraction and ionospheric distribution which are used for processing optical and radar measurements, high-altitude meteorological data are collected twice a day at designated times.

The ground survey support system provides accurate position information and directional reference as well as corrected data for the tracking and measurement facilities.

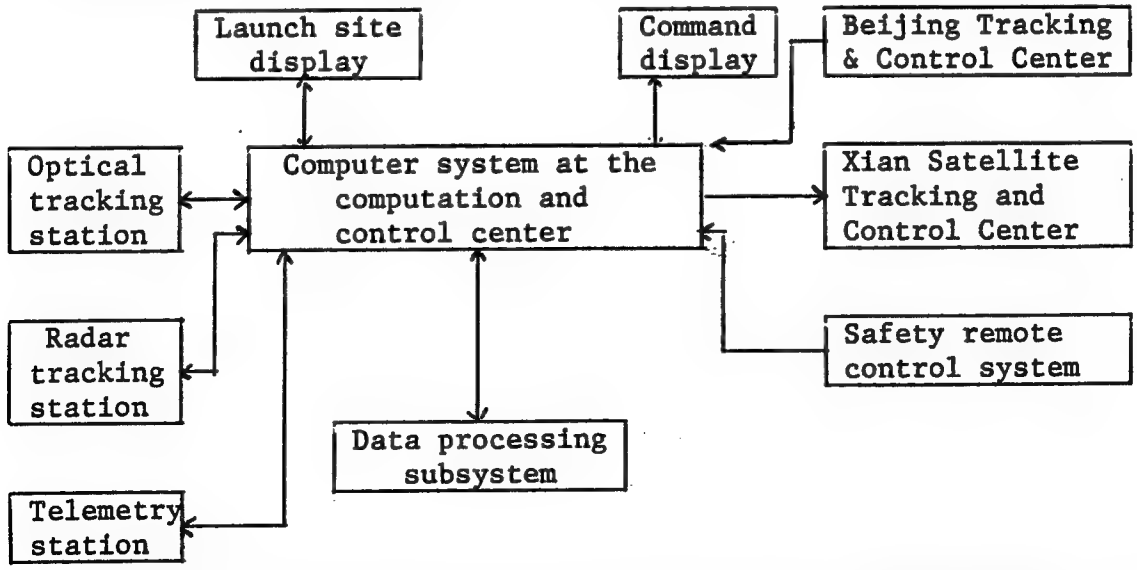

Figure 6. Functional Diagram of JSLC's Command, Control and Data Processing Systems

The measurement station at the Launch Center can achieve the national level-2 measurement standard; its advanced and complete set of equipment can perform measurement in the areas of time and frequency, radiowaves, electricity and mechanics; it can also provide corrections for various instruments, gauges and equipment.

The transport system of the Launch Center includes a dedicated airport that can accommodate large passenger planes, and a 270-km long dedicated railway whose south end is connected to the Lanxin railroad. Currently, launch vehicles are mostly delivered to the Launch Center by rail, whereas satellites can be delivered either by rail or by air.

The independently operated power plant provides dual-circuit electricity to the test and technical center and to the launch site.

The special fuel depot performs the functions of fuel storage, ordering, transportation, and chemical analysis and identification. In particular, chemical analyses are performed at regular time intervals in accordance with the technical specifications and test guidelines of the fuel.

III. Renovation of the Launch Center Now in Progress

With the continuing growth of China's aerospace industry, JSLC is undergoing major renovation. Many of its facilities and equipment are being replaced and modernized.

Renovation of the high-precision tracking radar has already been completed, its mean time between failures (MTBF) has been increased more than 70 times, the new optical equipment is expected to be in operation in the near future, the computers at the Launch Center and the measurement stations have been replaced by newer models, the test operations of the test and technical center and the launch site have been automated, the command, communications and control (C^3) system has been improved, the capacity of the power plant has been expanded, and the 30-year-old dedicated railway is undergoing major repair. The research and development efforts and satellite-launching experience over the past 30 years have also produced a highly qualified scientific and technical team of experts. In summary, JSLC not only has the capability to conduct launch tests of mid- to low-earth-orbit satellites for this country, it is also looking forward to providing launch services and related technical services for foreign customers.

Medical Care and Support for Manned Space Flights Reviewed

93FE0172A Beijing ZHONGGUO HANGTIAN [AEROSPACE CHINA] in Chinese No 10, Oct 92 pp 34-37

[Article by Yu Yaorong [0205 1031 2837]]

[Text] **Abstract**

In manned space flight, to provide medical care and medical support for the astronauts is a complicated but important problem. In this paper, the basic requirements, the methodology and the conditions for implementation of medical care and support for the astronauts are discussed. In addition, the equipment used to provide medical care and support are also described.

In manned space flight, an astronaut is subject to the effects of high acceleration, vibration and noise; in particular, he is under weightless conditions during orbital motion and may also be subject to the hazards of solar radiation and ionized particles during extra-vehicular activities. These extraordinary environmental conditions will produce complicated psychological, physiological and pathological effects on the astronaut. However, a manned space flight mission requires an astronaut to remain healthy physically and mentally to perform his tasks with high efficiency during the entire period of space flight and ground training. The purpose of medical care and medical support for the astronaut is to anticipate any medical problems and any psychological and physiological reactions that may adversely affect the astronaut during flight, and to take preventive and remedial measures in order to ensure the astronaut's health and safety in completing his mission.

I. Medical Care for Astronauts

1. Contents of Medical Care for the Astronauts

They include safety measures for daily exercises and special training, prevention and treatment of diseases, as well as dietary nutrition and health care. The specific activities include: monitoring of the astronaut's health condition; real-time (or quasi real-time) detection of potential space-related diseases and the causes for the astronaut's deterioration of flight performance; monitoring the life-protection cabin environment for astronauts, life safety system, communications equipment and personal protection and rescue equipment; and establishment of procedures for predicting, evaluating and monitoring the astronaut's psychological, physiological performance and well-being.

Medical care for the astronaut over the course of a manned space flight mission is generally divided into four stages: medical care during the training period, medical care prior to launch, medical care during space flight, and post-flight medical care.

(1) Medical Care During the Training Period

This includes determination of the astronaut's conditions of health, assessment of the astronaut's ability to perform his tasks and the effect of training, and establishment of the medical and physical standards for terminating training and releasing the astronaut for the space flight mission.

(2) Medical Care Prior to Launch

This includes complete medical examination of the astronaut at the launch site and special clinical tests and special biochemical, bacteriological and immunological examinations; examination of the astronaut's special physiological functions such as load-bearing ability of tilting bed and his lower limbs, load-bearing ability

during motion, the functions of his vestibular organs in maintaining sense of equilibrium, and his skeletal and muscular system. It also includes examination and monitoring of the cabin environment and life-protecting system, the personal protection and rescue equipment, as well as monitoring of the astronaut's conditions of health at launch time.

(3) Medical Care During Flight

This includes establishment of emergency procedures for treating diseases during flight; real-time (quasi real-time or return signals from space) monitoring of the psychological, physiological and environmental indicators via telemetry; monitoring of the television showing and communications, prediction and evaluation of the astronaut's health conditions and making decisions for medical treatment.

(4) Post-Flight Medical Care

This includes complete medical examination identical to the pre-flight examination; analysis of the astronaut's test data; and preparation of systematic medical report assessing the astronaut's health condition. It also covers the astronaut's daily activities after returning from space, prevention and treatment of diseases, dietary nutrition and physical exercise.

Routine medical care also includes general health care for the astronaut and his family members, as well as health care for the operating personnel, flight command and control personnel, and safety personnel during flight preparation. In addition, regular physical examination of the astronaut is performed to ensure that the astronaut remains in good health condition, and to establish a medical file which can be used to facilitate the treatment of any potential medical problems that may affect the astronaut's flight performance.

2. Procedures of Medical Care for Space Flight

The procedures of medical care include: 1) direct monitoring of the astronaut's activities and the psychological and physiological indicators of his health conditions; 2) monitoring the physical parameters of the environment required for the astronaut to perform his functions. The physiological indicators being monitored must provide the necessary information to perform emergency diagnosis and prediction of his health status. With the advancement of aerospace technology, the indicators selected for spaceflight medical care have become more simplified. In the late 1980's and 1990's, the United States and the Soviet Union routinely monitor EKG, breathing, blood pressure and body temperature as the primary indicators; they also use voice and television pictures as important secondary indicators. Even during the ascent phase and return phase, the EKG channel is being continually monitored to provide real-time medical care for the astronaut.

A difficult but important aspect of spaceflight medical care is the diagnosis and prediction of the astronaut's health condition. In practice, this is done by: 1) reviewing the accumulated statistical data base which contains the results of pre-flight physical examination, test results of the astronaut's physiological functions, and the astronaut's psychological and physiological responses during training; 2) comparing the results of clinical examination and physiological examination with in-flight data; 3) integrating and processing the information reflecting the astronaut's physiological changes and the physical parameters of the environment as well as voice and television pictures.

3. Implementation of Spaceflight Medical Care

The implementation of spaceflight medical care can be divided into the following four categories.

(1) Pre-Flight Medical Care

Prior to launch, medical personnel and training personnel should closely monitor the astronaut's training activities; they should conduct systematic and complete inspections and tests of the spacecraft cabin environment and equipment, the life protecting system, the communication and monitor system, the physiological indicator and measurement system, the space suit and personal protective equipment based on medical safety and reliability requirements. Medical-care personnel should also coordinate with medical-support personnel to monitor the astronaut's health conditions, perform regular physical checkups, and offer medical advice regarding the astronaut's fitness in carrying out the flight mission; they should also participate in pre-flight medical care activities. As part of pre-flight medical care, the medical data of the astronaut's health status during the training period and the results of annual medical examination are compiled and stored in a reference data base to be used for prediction and diagnosis during the space mission.

(2) In-Flight Medical Care

This refers to medical care covering the period from the date of launch to the date of return. As part of the scheduled flight activities, the astronaut will provide his own medical care based on medical information transmitted from the tracking and control center via the telemetry and communication system; these include: carrying out the scheduled activities on the date of launch, reporting the health status on a daily basis, assisting other astronauts in measuring physiological indicators, performing physical exercise during flight, administering required medication, operating onboard equipment, and executing required test procedures. At the same time, the ground medical personnel are tasked to monitor and analyze the physiological indicators, the environmental parameters and the voice and television pictures of the astronaut which are sent back to the ground via telemetry. The analyzed results are compared with the astronaut's normal range of physiological data to deduce his likely psychological and physiological behavior. A final assessment of the astronaut's physical condition is made by the

medical care unit of the spaceflight command and control center to determine whether the astronaut can continue to perform his mission.

(3) Post-Flight Medical Care

After the flight mission, complete physical examination similar to the pre-flight examination is conducted, and the medical data collected prior to, during and after the flight mission are analyzed and studied to arrive at an overall assessment of the astronaut's health condition; these data are also used to improve the planning of medical care for future spaceflight missions. In addition, medical care personnel will coordinate with the medical support organization to monitor the astronaut's health condition and safety upon returning to earth, and continue to provide medical care such as disease prevention, diet and nutrition, and physical exercise.

(4) Medical Care During Extra-Vehicular Activity

Extra-vehicular activity (EVA) is a necessary part of the spaceflight mission. The critical medical problem during EVA is to prevent sickness due to high-altitude decompression. For this reason, it is essential for the astronaut to inhale sufficient oxygen and exhale nitrogen before EVA. An important task of medical care is to control the duration of this oxygen treatment and the sequence of extra-vehicular activities depending on the length and intensity of the activity, and the design of the pressure system of the spacesuit. It is also the task of medical care to ensure that the astronaut has adequate rest and sleep and is given a nutritious meal before EVA.

In order to provide effective and timely medical care, the medical care organization consists of a team of experienced experts in space medicine and clinical medicine who not only are well trained in the contents, methods and procedures of medical care in space, and familiar with the astronaut's medical records, but have also participated in the entire ground training process; thus, they are well informed about the astronaut's mental and physical conditions as well as his psychological, physiological and biochemical reactions during training. They also have a good knowledge of the detection and measurement systems used in spaceflight medical care and the techniques and criteria used to evaluate the astronaut's psychological and physiological well-being.

II. Medical Support for Astronauts

Medical support and medical care for astronauts are closely related. As with medical care, medical support is an activity which covers the astronaut's daily life, training and flight mission. The purpose of medical support is to maintain and improve the astronaut's health condition. It involves setting up a detailed timetable for medical checkups, establishing plans of medical support for each flight mission, providing a schedule for training, sleeping, recreation and athletic activities during the training period; it also involves setting up a health maintenance schedule for the astronaut and his family members, as well as delivering health care services such as disease treatment, immunization and protection against epidemic diseases.

1. Pre-Flight Medical Support

This includes setting up a schedule for the astronaut's activities prior to launch: training, sleeping, recreation and athletic activities; conducting three to four medical examinations to provide reference data for post-flight comparison; providing pre-flight health care services such as treatment of disease, immunization plan, and monitoring environmental and personnel epidemic diseases. It also prepares the necessary equipment used for in-flight medical support and provides sanitation support such as inspection of the food supply and drinking water used by the astronaut, inspection of the medicine bags, cabin sterilization, quarantine and isolation of the astronauts.

2. In-Flight Medical Support

This includes setting up a schedule for the astronaut's activities during flight, establishing self and mutual emergency rescue procedures, carrying out the scheduled plan of athletic training and cultural and recreational activities, and providing medical consultation, guidance and assistance.

3. Post-Flight Medical Support

This includes providing medical treatment to the astronaut in the landing zone, organizing rescue teams consisting of medical-support physicians and ground personnel, establishing mobile rescue stations, carrying out medical rescue and escort missions under normal and abnormal conditions, and conducting post-flight physical examinations. It also involves working with the medical care personnel to analyze the results, to evaluate the astronaut's health condition, to establish new activity schedules, and to provide support for recovery and recuperation which includes diet and nutrition, sanitation and disease control.

III. Equipment Used for Medical Care and Support

These refer to the equipment used to measure the astronaut's physiological parameters and to monitor the physical parameters of the cabin closely related to the astronaut and other support equipment.

1. Equipment for Medical Care

The onboard medical-care station contains equipment for displaying EKG and heartbeat, and for preprocessing, storing, analyzing and transmitting the measured data, as well as equipment for measuring, displaying recording warning and transmitting such information as breathing, blood pressure and body temperature in order to predict and assess astronaut's physical status. It also has certain research equipment such as vibrocardiograph, cardiophonograph, electrodermograph, electroencephalograph, nastagmograph, and

motion coordination measuring unit. With recent advances in aerospace and electronic technologies, many countries with manned spaceflight capabilities are studying effective indicators for medical care and developing small, integrated biomedical monitoring equipment. Although the new indicators are becoming increasingly simplified, the commonly used indicators are still EKG, breathing, blood pressure, body temperature, voice and television pictures.

2. Equipment for Medical Support

The onboard medical support equipment includes medicine bags, first-aid bags, sanitation supplies (including sleeping bags), learning and athletic equipment and supplies such as dynamometer, bicycle ergometer running station, negative pressure equipment, recreational equipment, and maintenance and repair tools. The ground-based medical care and medical support equipment includes those located at the medical care and support center, the launch site, the recovery site and the emergency center.

To ensure high-quality medical care and support, it is also necessary to establish a cooperative medical network that includes first-class hospitals, research centers for disease control and health sanitarium.

Liquid Hydrogen Two-Phase Flow Test System Described

93FE0219B Beijing ZHONGGUO HANGTIAN [AEROSPACE CHINA] in Chinese No 11, Nov 92 pp 42-44

[Article by Zhong Jingyi [6945 7234 3354] of the Beijing Rocket Engine Testing Institute: "Testing System for Study of Liquid Hydrogen Two-Phase Flow"]

[Text] **Abstract**

A liquid hydrogen two-phase flow test system has been developed by the Beijing Rocket Engine Testing Institute; it has four subsystems: the weighing subsystem, the pressurization subsystem, the liquid feeding and recovery subsystem, and the measurement and control subsystem. In this article, the main features of the test system are described, and the accuracy of a standard-weight dynamic replacement method for mass flow measurement is presented.

Liquid hydrogen is a low-temperature liquid with an extremely low boiling point and low latent heat. During the transport process, a state of gas-liquid two-phase flow often exists. With the development of increasingly sophisticated hydrogen-oxygen engines, there is an urgent need to better understand the flow mechanism of liquid hydrogen, and to determine the effect of the state of the fluid flow on parameter measurement. For this reason, this institute in 1982 began to construct a liquid-hydrogen two-phase flow test system for conducting research on low-temperature flows. This system was completed in 1988.

I. Main Features of the System

The basic elements of this multi-function low-temperature flow test system are two low-temperature containers (a feeding container and a recovery container) and a low-temperature pipeline that connects the two containers. The pipeline has a sufficiently long straight section and a test section; it is equipped with different sensors for measuring temperature, pressure, flow rate and density.

The versatility of this system is illustrated below:

1. The system can be used for testing liquid hydrogen as well as liquid oxygen and liquid nitrogen. However, from the safety point of view, the system cannot be used for liquid hydrogen and liquid oxygen at the same time. Also, for structural considerations, the system must be well insulated when used for liquid hydrogen and must be able to bear heavy load when used for liquid oxygen.

But a shared system has certain advantages: (1) it has a wider range of applications; (2) its cost is significantly lower because preliminary tests can be conducted using inexpensive liquid nitrogen rather than the costly liquid hydrogen.

2. The system can be used for a variety of flow tests such as measuring pressure drop, determining the void ratio of two-phase flow, determining the state of fluid flow, heat transfer test, and flow tests of various new sensors. Changing from one test to another requires only replacing the test section without changing other parts of the system; this feature greatly reduces test preparation time.

3. The system can also be used for calibrating low-temperature flow meters. Mass flow rate is an important parameter that must be accurately measured in any low-temperature flow test; however, the accuracy requirement for measuring the flow rate of liquid hydrogen cannot be satisfied by conventional flow meters. Therefore, this system has been designed to serve as a weighing system by incorporating the feeding container with a force measuring device. It not only provides accurate flow-rate measurements during flow test, but can also be used for calibrating other flow meters.

II. System Description

The system is divided into four subsystems.

1. The Weighing Subsystem

The weighing subsystem consists of the feeding container, the weight application device, the force sensor, the digital strain gage, the digital comparator, and the time-interval measuring unit, as shown in Figure 2 [photograph, Figure 1, not reproduced].

(1) Operating Principle

The weighing subsystem is designed to provide accurate mass flow rate using the standard-weight dynamic replacement method.

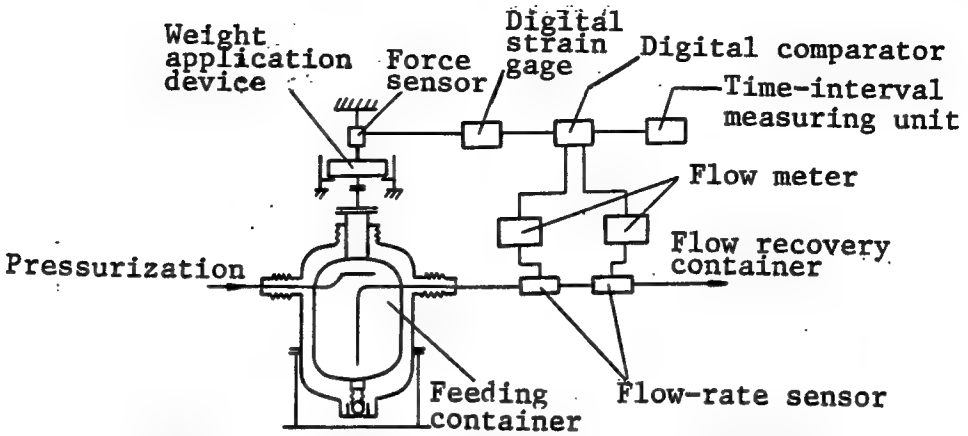

Figure 2. Standard Weight Dynamic Replacement Weighing System

First, the liquid-filled feeding container is pressurized and maintained at a specified pressure level, causing the liquid to flow out. Thus, the mass in the container decreases and is reflected by the decreasing reading on the digital strain gage. When the flow is stabilized and the strain-gage reading drops to a pre-set value in the digital comparator, the comparator transmits a signal, which triggers the time-interval measuring unit (if the system is used for flow meter calibration, then the measuring instrument of the flow meter is also triggered) to start the time count and to send a signal to the operator for weight addition. When the operator receives the signal, he turns on the weight application device which adds standard weights to the force sensor. The added weights cause the strain-gage reading to rise above the pre-set value of the digital comparator. As the liquid continues to flow out, the strain-gage reading continues to drop, and eventually reaches the pre-set value again; at this point, the comparator transmits a second signal, which stops the timing unit (in the case of flow-meter calibration, recording of the mass flow-rate is also stopped). The total liquid mass flow during the measured interval is equal to the mass of standard weights added (see Figure 3). Therefore,

Mass Flow Rate G = Mass of Standard Weights M'/Time Interval Δt

If the mass of the compressed air is taken into account, then

Mass Flow Rate G = Mass of Standard Weights + Mass of Air/Time Interval Δt

In Figure 3, point A is the point of weight addition, and B, C are the points of comparison.

In the standard-weight dynamic replacement method, the effects of pressure, temperature, flow impact and the additional force exerted by the sylphon bellows can be neglected.

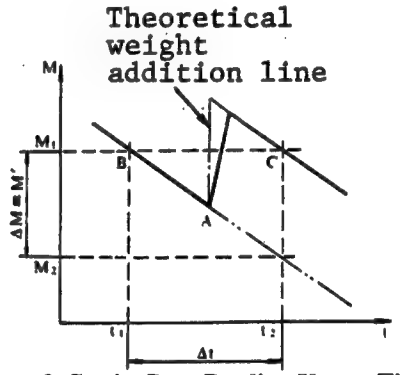

Figure 3. Strain Gage Reading Versus Time

(2) Equipment Description

a. Feeding container

Volume	2.5 m^2
Operating pressure	0.25 MPa
Method of insulation	High-vacuum multi-layer insulation

The feeding container also serves as a weighing container. Because of the low density of liquid hydrogen, in order to ensure weighing accuracy, it is necessary to keep "skin weight" to a minimum; in other words, only the inner pipe should be weighed. The inner pipe extends to the outside through the sylphon bellows, where it is connected to the force sensor. During the design and manufacturing process, special measures are taken to reduce the shape and position tolerance of the container in order to ensure weighing repeatability.

b. Weight application device

This is a pneumatically operated mechanical device for adding, removing and selecting standard weights of different sizes which are placed inside the device; they

can be selected one-at-a-time or several at the same time. The weight addition and removal processes are stable, swift and concise.

c. The force sensor has an accuracy of +/- 0.03 percent, and the digital strain gage has an accuracy of +/- 0.005 percent; the digital comparator is matched to the strain gage.

2. Pressurization Subsystem

The pressurization system has two parts: the hydrogen pressurization subsystem and the nitrogen pressurization subsystem. It can operate either in the manual mode or in the automatic mode when a constant pressure in the container must be maintained.

3. Liquid Feeding and Recovery Subsystem

During tests, liquid flows from the feeding container through the supply tube and the test section into the recovery container.

The supply tube is approximately 22 m long and has a diameter of Φ50; it uses vacuum multi-layer insulation. Its mid section is a removable test section.

The recovery container has a volume of 3.5 m^3, and operates at a pressure of 0.3 MPa; it also uses vacuum multi-layer insulation.

4. Measurement and Control Subsystem

Temperature is measured using nickel-chromium and gold-iron thermocouples or heat-sensitive resistance type sensor. Pressure is measured using strain-type pressure sensor. Density and liquid surface are measured using capacitance-type sensor.

The mass flow meter is composed of a turbine, a rectifier and a density sensor. Time interval measurement is performed using a digital frequency meter.

All the instruments (including the digital strain gage and comparator) and the control console are located in the measurement and control room.

III. Technical Specifications of the System

Since the test method and requirements vary with the individual test, it is difficult to give general specifications for the system. The only specifications on the accuracy of mass flow rate have been established from repeated tests using the standard-weight dynamic replacement method; they are: +/- 0.4 percent for liquid hydrogen and +/- 0.2 percent for liquid oxygen and liquid nitrogen.

The system has been used for measuring pressure drop and void ratio in two-phase flow, measuring temperature layers in low-temperature liquids, and calibrating mass flow meters. Satisfactory results have been obtained in all these tests.

Breakthrough in Composite Material/Glass Fiber Reinforced Plastic Forming Technology

93P60137A Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 16 Dec 92 p 1

[Photoreport, text by unidentified KEJI RIBAO staff writer: "Composite Material/Glass Fiber Reinforced Plastic Forming Technology," photo by Liu Dong]

[Text] The "Composite Material Three-Matrix Circular Winding Forming/Shaping Technology and Its Application" project jointly undertaken by Beijing University of Aeronautics & Astronautics (BUAA) and Beijing Tianyi [1131 5065] New Technologies Co. passed technical appraisal in Beijing on 14 December. This major new material development, realized over a 1-year period by lecturer Sun Zhengjun [1327 2973 6511] of Teaching & Research Section 104 in the BUAA Materials Science & Engineering Department, was reported to State Patent authorities in March 1992. Using this new technology, they [i.e., Sun and the Tianyi engineers] have developed a bamboo/glass fiber reinforced plastic ship and a landing gear for a new helicopter model, both unique in the world.

The appraisal experts noted that this technology pioneers a new application of composite materials for force-bearing members and structures, and that these simple shaping techniques will have a wide variety of applications in the shipbuilding, automotive, aircraft, and bridge building areas. Since the materials' performance meets or exceeds that of metal ships, it can be used in newer-generation products to replace the wooden ships, concrete ships, and metal ships now in service in the nation.

The photograph [not reproduced] shows lecturer Sun Zhengjun delivering a report on the development of this achievement to the appraisal experts.

Crystal Habit and Surface Oxide Film Analysis of Fe Nano-Particles

40100060A Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 41 No 11, Nov 92 pp 1842-1848

[English abstract of article by Sun Xiu-kui, Chen Wen-xiu, Xu Jian, Fan Xue-shu, and Wei Wen-duo of the State Key Laboratory of Rapidly Solidified Non-Equilibrium Alloys, Institute of Metal Research, CAS, Shenyang 110015, and Wang Wen-hao of the Laboratory of Structure Analysis, Institute of Metal Research, CAS, Shenyang 110015; MS received 26 Nov 91]

[Text] The crystal habit and size of Fe nano-particles prepared by an inert gas evaporation method have been observed with transmission electron microscope. The composition, structure and thickness of the surface oxide film on the Fe nano-particles have been analysed in detail by means of several techniques, such as X-ray diffraction, electron diffraction, X-ray photoelectron spectrum and Auger electron energy spectrum. A model of the composition and structure for these particles is given. The results show that the crystalline structure of the Fe nano-particles is consistent with the general α-Fe, i.e., bcc structure. On the surface of these particles, there are double layers of the oxide film with about 3 nm thickness, in which the outside is γ-Fe_2O_3 of about 1 nm thickness and the inside is Fe_3O_4 of about 2 nm thickness.

The crystal structure of the two kinds of oxide are of cubic spinel-type. The results also indicate that the Fe nano-particles prepared by the gas evaporation method are very stable in dry air. Though the oxide film is thin, it is quite compact and gives good protective effect on the particles.

Anti-HFRS Monoclonal Antibodies Developed

93P60130A Beijing YIYAO XINXI LUNTAN [CHINA MEDICAL TRIBUNE] in Chinese 10 Dec 92 p 1

[Article presented at China-Japan Medical Conference]

[Summary] Eleven strains of anti-hemorrhagic fever renal syndrome (HFRS) rat monoclonal antibodies (McAb) have been obtained by Xiang Weisong [4161 3634 2646] of Tangdu Hospital of the Fourth Military University. Spleen cells from Lou/C IgK-1a, a 3-month-old female rat pre-immunized with an old strain of HFRS virus (HFRSV), were fused with rat myeloma cells IR983F, from which 11 strains of positive clones were screened by ELISA and indirect immunoenzyme assay. The new strains were cloned three times to ensure the stability of the following features: 1) Subtypes: two of the nine strains were found to be IgG2a subtypes, the other seven strains were IgM subtypes. 2) Titers: ELISA titers of the culture supernate were tested to be from 1: 10^2 to 1: 10^3; higher dehydrated ELISA titers of 1: 10^6 to 1: 10^7 were also obtained 2 weeks after peritoneal inoculation of hybridoma. Normally 50-60 ml/rat or as high as 110 ml/rat dry weight of McAb was harvested. 3) Specificity: rat and mouse McAb were found to react only with HFRSV, but not with encephalitis B viruses, herpes simplex viruses, plague viruses or normal antigens. 4) Sensitivity: rat McAb was tested to be as sensitive as mouse McAb. Sensitivity tests of rat McAb and mouse McAb on HFRSV-infected brain cells of suckling mouse and freeze-melt antigen were conducted using the double-sandwich ELISA method; sensitivities of rat McAb and mouse McAb were found to be very close. 5) Stability: biological activities of rat McAb were fairly stable under such conditions as repeated freezing and heating, heat-tolerate testing in 40-50°C for 30 minutes, and semi-saturated ammonium sulfate treatment. 6) Animal protection: four strains were found to be highly protective, two slightly protective, and the remaining five have no protective ability at all. However the five non-protective strains could prolong lives of HFRSV-infected suckling mice. Rat McAb is believed to be superior to mouse McAb, because rat McAb provides shorter treatment time and better result if doses of multi-rat McAb are used in the treatment. According to the researchers, the large-scale production, easy separation, different antibody-producing pool from mouse McAb, and strong immune response are the advantages of using rat hybridoma in producing McAb.

First Laser-Detection Atomic Force Microscope Developed

93P60130D Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 18 Dec 92 p 1

[Article by Zhang Yaguang [1728 0068 0342]]

[Summary] Researcher Bai Chunli [4101 2504 4409] of the CAS Institute of Chemistry has developed the first Chinese laser-detection atomic force microscope following development of China's first computerized tunneling scanning microscope and atomic force microscope. The newly developed microscope can differentiate particles down to atom level and can scan a range of 3 μm x 3 μm area. It has been used to differentiate atom surface images of mica and graphite, and to determine surface structures of tobacco mosaic virus (TMV), polypeptides, polystrene latex, macromolecule polymers, and compact discs (CD). The microscope will be useful in such areas as microelectronics machinery, examination of materials, aerospace and biomedicine. Beijing University and the Vacuum Physics Laboratory of the CAS have reportedly put in their orders to purchase the new microscope.

Anti-Lung Cancer Guided Drugs Synthesized

93P60130C Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 17 Nov 92 p 2

[Article by Huang Xin [7806 6580]]

[Summary] Led by Ge Xirui [5514 6932 6904], researchers at CAS Shanghai Institute of Cell Biology and Institute of Pharmacology have developed three different series of anti-lung cancer monoclonal antibody (McAb) using cell engineering technology. By combining McAb specific to lung cancer and drugs or toxins poisonous to cancer cells, the researchers have successfully ligated the newly developed McAb with trichosanthin to produce three highly-effective guided drugs, which are also called "biological missiles." Test results indicate that the ligant drugs exhibit stronger inhibition reactions that does McAb alone. All the newly developed anti-lung cancer McAb can be used to further develop drugs for treating disorders of the immune system or toxins targeting the immune system. The success is an important step to achieve an effective cancer treatment.

Electrical Cell Fusion Instrument Developed

93P60130B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 27 Oct 92 p 2

[Article by Fan Jian [5400 1696] and Ju Hong [7263 4767]]

[Summary] The BIT-1 intelligent, multi-purpose, electric field-inducing cell fusion instrument has been jointly developed by the Beijing Science and Technology University and the CAS Biophysics Institute. The instrument consists of a sensor electrode and a set of integrated electrodes for microscopic observation, videotaping or taking pictures of the entire cell fusion process. The instrument can also conduct an intelligent, dynamic examination of cell suspension by microcomputer. The instrument has been successfully used in fusing microorganisms, plant and animal cells. It also can be used in breeding industrial microorganisms, improving plant varieties, preparing monoclonal antibodies, introducing macromolecules into cells and conducting gene transfers.

It is far superior to the conventional, time-consuming breeding method which uses artificial cross-breeding to produce genetic varieties with limited access to gene resources. According to Beijing Medical University and Beijing Plant Cell Biotechnology Laboratory, the instrument has a 50-60 percent fusion rate and is fast in lining up cells for fusion. The invention is now being patented in China.

Incompatibility Grouping of R Plasmids From Salmonella Typhi

40091006A Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 12 No 6, Dec 92 pp 357-360

[English abstract of article by Gu Guohao [7357 0948 3185], Mu Rongpu [4476 2837 2528], et al. of the Medical Biotechnology Institute, Suzhou Medical College, Jiangsu]

[Text] The incompatibility grouping of 11 R plasmids, isolated from multiresistant *S. typhi*, have been studied. The results showed the incompatibility reactions of these plasmids with R_{40a} or pIP_{55} standard plasmid. All of them belonged to the Inc C group. They were different from the group HI_1 of the resistant *S. typhi* from abroad in recent years. We termed temporarily them as pMG plasmid. The grouping results of plasmids from the transconjugant colonies have been demonstrated by the agarose gel electrophoresis. The characteristics were of its high molecular weight (98.6 MD), surface exclusion, and thermosensitive mode of transfer, etc. We suggest that the dissemination and spreading of pMG plasmids are main factors which made the prevalence of the multiresistant *S. typhi* isolated in Suzhou area during 1987-1988, and the group C is associated with R plasmids from the epidemic *S. typhi* in some areas of China by the data obtained since 1985. Up to now the plasmid is still present in *S. typhi* in some cases of typhoid fever in Suzhou area. Therefore more attention should be paid to it.

Key words: *Salmonella typhi*; R plasmid; Incompatibility grouping

Polymerase Chain Reaction for Construction of the Recombinant Plasmid Containing the MOMP Gene of Chlamydia Trachomatis Serovar F

40091006B Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 12 No 6, Dec 92 pp 361-363

[English abstract of article by Xu Fan [1776 1581], Feng Huimin [7458 1979 2404], et al. of the Department of Microbiology and Immunology, Sun Yat-Sen University of Medical Sciences, Guangzhou]

[Text] The major outer membrane protein (MOMP) gene of chlamydia trachomatis serovar F was obtained by using polymerase chain reaction (PCR). The products were subsequentially cloned into plasmid pUC18 via the defined restriction endonuclease site in primers of PCR. The recombinants that contained the MOMP gene were identified by nested PCR. The successful performance of PCR in chlamidial research and construction of the recombinant plasmids of MOMP gene provided a very useful tool in developing clinical diagnostic methods and also a basis to express the MOMP gene in *E. coli*.

Key words: Venereal chlamydia trachomatis serovar F; Polymerase chain reaction (PCR); Gene cloning; Nested PCR

Study on the Immune Mechanism of JE Attenuated Live Vaccine (SA_{14}-14-2 Strain)

40091006C Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 12 No 6, Dec 92 pp 364-366

[English abstract of article by Jia Lili [6328 7787 7787], Zheng Zheng [6774 6927], and Yu Yongxin [0205 3057 2450] of the National Institute for the Control of Pharmaceutical and Biological Products, Beijing]

[Text] Comparative study on the immune mechanism between JE attenuated live vaccine (SA_{14}-14-2) and inactivated vaccine in mice revealed apparent difference. At 1, 3 and 6 months after vaccination with both vaccines, one dose for live vaccine and two doses for inactivated vaccine, the titers of neutralizing antibody in the both groups of immunized mice were all $<1:5$ or 1:5, however the rates of protection after challenge with JE virulent virus showed marked differences, 87.5 percent-100 percent in the live vaccine groups and 33 percent-60 percent in the inactivated vaccine groups.

The rates of protection in the two groups of mice into which serum/spleen cells of mice immunized with live and inactivated vaccines were transferred also showed differences, 80 percent/50 percent in the serum/spleen cells of live vaccine transferred groups and 33 percent/10 percent in the inactivated group.

The immunity being partially destroyed by injection with cytoxan, the mice were then immunized with either live or inactivated vaccines and challenged 14 days later, the rates of protection in the group of live vaccine showed apparently higher than the inactivated vaccine group, 56 percent (3 times of injection with cytoxan) to 80 percent (2 times) in the live vaccine groups and only 10 percent-20 percent in the inactivated groups.

Key words: Japanese Encephalitis (JE) virus; SA_{14}-14-2 live vaccine; Immune mechanism

Preliminary Analysis of the Protective Antigens Expressed on the Bivalent Hybrid Strains With McAb

40091006D Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 12 No 6, Dec 92 pp 367-370

[English abstract of article by Li Hong [2621 4767], Peng Hong [1756 5725], Gao Jieying [7559 2638 5391], et al. of the Institute of Microbiology and Epidemiology, Academy of Military Sciences, Beijing]

[Text] The expression of the protective antigens of the bivalent hybrid strains (FSM-2117 and FS-18) was analysed by whole cell ELISA, flow cytometry and immunoblotting with 2 monoclonal antibodies (McAbs) to the protective O-polysaccharide epitopes on the outer membrane Shigella flexneri 2a and S. sonnei. The results showed that both FSM-2117 and FS-18, comparing to their parents, expressed the F2a O-antigen well; however, on expressing O-antigens of Shigella sonnei, FSM-2117 was much better than FS-18. On immunoblotting, the difference between FSM-2117 and FS-18 in the expression of S. sonnei O-antigen was observed. These suggest that McAbs might be available for screening and evaluating genetic-engineering vaccine candidates.

Key words: Monoclonal antibody; Bivalent hybrid strain of dysentery bacillus; Whole cell ELISA; Flow cytometry; Immunoblotting

Antibody Response of Patients With Epidemic Hemorrhagic Fever to the Virus Structural Proteins

40091006E Shanghai ZHONGHUA CHUANRANBING ZAZHI [CHINESE JOURNAL OF INFECTIOUS DISEASES] in Chinese Vol 10 No 4, Nov 92 pp 187-191

[English abstract of article by Bai Xuefan [4101 7185 1581], Yang Weisong [2799 3634 2646], et al. of the Epidemic Hemorrhagic Fever Laboratory, Tangdu Hospital, The Fourth Military Medical University, Xian]

[Text] To elucidate the properties of Epidemic Hemorrhagic Fever (EHF) Virus structural proteins, nucleoprotein (NP), glycoprotein 1 and 2 (G1 and G2), and their relation with antibody response of EHF patients, the sera antibodies to NP, G1 and G2 and neutralizing antibodies in 31 cases of EHF patients were determined by radioimmunoprecipitation and half-micro plaque reduction neutralizing test. The results show that in 80 samples, anti-NP appears the earliest, positive in 100 percent of patients at the 7th day from onset of the illness; anti-G2 is positive in 50 percent of cases at 5th-6th day; anti-G1 appears the latest, about 50 percent up to the 11th-12th day. The neutralizing antibody response in moderate and severe patients is strong, but is weak in critical patients. In addition, it is closely related with immunoresponse to EHF virus glycoproteins, and neutralizing antibody level in sera with positive anti-G1, G2 is higher than that without anti-G1, G2. It is suggested that detecting these antibodies will allow us to define the pathogenesis of EHF and help us to evaluate the severity of the illness and direct the treatment.

Key words: Epidemic Hemorrhagic Fever; Virus; Antibody Response; Radioimmunoprecipitation

Molecular Cloning of Cephalosporium Resistant Gene From Entero Pathogenic Escherichia Coli

40091006F Shanghai ZHONGHUA CHUANRANBING ZAZHI [CHINESE JOURNAL OF INFECTIOUS DISEASES] in Chinese Vol 10 No 4, Nov 92 pp 211-214

[English abstract of article by Fang Lijun [2455 0448 0689], Wang Shunlin [3769 7311 2651], et al. of Children's Hospital, Shanghai Medical University, Shanghai]

[Text] A drug resistant strain of EPEC has been isolated from stool of infant diarrhea in our hospital. Plasmid DNA was isolated and partially digested with restriction enzyme. After ligated with arms of phage DASHII, a DNA library for EPEC plasmid was established. By repeated transfection into non-resistant host cells and screening, recombinants containing genes resistant to ampicillin (Amp^r) and cephalosporium ($Ceph^r$) were isolated. Eventually, a subclone of 2.5 kb DNA fragment containing $Ceph^r$ gene was obtained. Our results could be important for further elucidating the molecular mechanism of resistance to cephalosporium and related antibiotics.

Key words: Entero Pathogenic Escherichia coli (EPEC); Cephalosporium resistance; Gene library; Plasmid; Subclone

Study on Experimental Therapy of Alprenolol-Targeted Liposome

40091006G Beijing BEIJING YIKE DAXUE XUEBAO [JOURNAL OF BEIJING MEDICAL UNIVERSITY] in Chinese Vol 24 No 5, Oct 92 pp 360-362

[English abstract of article by Zhang Lingzhi [1728 7227 5347], Tang Jian [3282 0256], et al. of the Laboratory of Cardiopulmonary Endocrinology]

[Text] In order to investigate feasibility of applying receptor ligand as homing devices to potentiate targeting of liposome carried drugs, we observed tissue distribution characteristics of alprenolol-liposome containing glutathione on isoproterenol (ISO)-induced rat myocardial necrosis. The results showed alprenolol altered liposome distribution in vivo and led the liposome to distribute tissues and organs rich in β-receptors, such as lung and heart. This alprenolol-liposome encapsulated with glutathione showed effectively therapeutic action on ISO-induced rat myocardial necrosis. The results suggest that use of receptor ligand as homing device is a method of powerfully potentiating specific targeting of liposome.

Key words: Liposome; Ligand; Glutathione; Alprenolol; Ischemia

Studies of Cockroachcidal Toxin

40091005M Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 32 No 5, 1992 pp 383-386

[English abstract of article by Wang Chunsheng [3769 2504 3932], Chen Tao [7115 3447], et al. of Wuhan Institute of Virology, Academia Sinica, Wuhan]

[Text] A cockroachcidal bacterial isolate CW-W-90-3 was selected by egg yolk agar plate. The isolate produced phospholipase C (PLC) which was pathogenic to the nymph of cockroach. The conditions for production of high level PLC indicated that using LB medium supplement Tween-80 or minimal medium could effectively increase the activity of PLC. The optical phase for production of PLC was in the period of 12-18 hours and below pH8.0 The activity of PLC was reduced along with the culture time until 48 hours. The PLC was resistant to heat. The partially purified PLC from the culture supernatant was assayed by using cockroach nymphes, and the mortality rate was 71.74 percent.

Massively Parallel Processors Enter China Market

93P60129A Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 49, 16 Dec 92 p 5

[Article by Meng Nianqing [1322 1819 7230]: "Massively Parallel Processors Enter China Market"]

[Summary] One of the leading U.S. makers of massively parallel processors (MPPs), nCube, recently concluded an exclusive Asian sales representative agreement with Hong Kong's Yaohua [5069 5478] Science & Technology Ltd., thus becoming the first MPP manufacturer to enter the China market. At present, nCube can supply the China market with its nCube 2E and nCube 2S/1 systems. The 2E is a desk model incorporating independently designed 20 MHz nCube 2 processor chips; in the 128-processor (maximum) configuration, it provides a peak performance of 420 MFLOPS [million floating-point operations per second]. The 2S, nCube's improved model, incorporates 25 MHz nCube 2S processor chips; in the 8192-processor (maximum) configuration, it provides a peak performance of 34 GFLOPS [billion floating-point operations per second] and 123 GIPS [billion instructions per second]. The highest-performance submodel now purchasable domestically is the nCube 2S/1 system, with a maximum of 1024 processors and corresponding performance of 4.2 GFLOPS. The State Intelligent Computer Research & Development Center is now preparing to establish contacts for purchase of an nCube 2E system, and hopes to thus become the first domestic nCube user.

Advanced Radar Systems Developed

CW Exterior-Ballistics Measurement System

93P60133A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 23 Dec 92 p 1

[Unattributed article: "All-Motor-Driven, High-Accuracy Continuous Wave Exterior-Ballistics Measurement System," part of feature article "10 Major Electronics S&T Achievements of 1992"]

[Summary] Developed by MMEI's Institutes 27 and 39, this system—the nation's new-generation all-motor-driven, high-accuracy, high-reliability, multistatic CW exterior-ballistics radar—can accurately measure the track of a missile during powered-flight phase, predict missile deviation from impact point, and measure error separately in the missile guidance elements, yielding improved missile designs. Computer processing produces real-time track data and indicates on the display any faults in the missile during in-flight tests. The system, comprised of measuring equipment located at a master station and three substations, will make a notable contribution to the nation's satellite and missile development.

384 Three-Coordinate Radar

93P60133B Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 23 Dec 92 p 1

[Unattributed article: "384 Three-Coordinate Radar," part of feature article "10 Major Electronics S&T Achievements of 1992"]

[Summary] Developed by MMEI's Institute 38, the model 384 radar is the nation's first all-coherent, frequency-agile mid-to-long-range large three-coordinate vectoring radar for airspace monitoring. It provides real-time multitarget discovery, recording, tracking, and display, and via radar-plot transmission equipment can send display imagery and track data to command and control centers. The 384 incorporates several 80s-era advanced technologies such as a broadband low-sidelobe multi-beam antenna, a multi-microcomputer monitoring network, and automatic fault detection; its deployment will raise standards for the nation's air defense equipment.

MTV311 Television Tracker

93P60133C Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 23 Dec 92 p 1

[Unattributed article: "MTV311 Television Tracker," part of feature article "10 Major Electronics S&T Achievements of 1992"]

[Summary] The MTV311 television tracker, developed by MMEI's Institute 3, is a complementary product for the HN-C03-M radar, and provides automatic tracking and measurement of air target angular position. This long-effective-range, high-tracking-accuracy, high-reliability, highly jam-resistant unit, with superior low-angle tracking performance, consists of a short-focal-length optical lens, a CCD solid-state camera, a digital tracker, a microprocessor controller, and digital signal processing components. It has three operating modes: TV monitoring, semiautomatic tracking, and full automatic tracking. Its tactical technical performance takes a leading place domestically, and meets advanced standards of international products of like kind. This equipment can also be used in air defense fire control and antimissile systems, as well as in harbor, airport, and transport radar systems.

$LiTaO_3$, LATGS Infrared Detectors Developed by SITP

93P60136A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 18 Dec 92 p 1

[Article by Xiao Qiang [5135 1730]: "Shanghai Develops New Infrared Sensors"]

[Summary] Two new international state-of-the-art pyroelectric IR detectors developed and recently marketed by the Shanghai Institute of Technical Physics (SITP) passed formal technical appraisal a few days ago in Shanghai. The first new device, a $LiTaO_3$ [lithium tantalate] detector used in gas analysis equipment, has applications in the metallurgical, petrochemical, coal, environmental protection, and medical industries. The LATGS [expansion unknown] detector, which replaces a vacuum thermocouple, has been incorporated into the IR spectrophotometer made by the Tianjin Optical Instruments Plant. The 350 LATGS devices used by the plant for this product have generated over 600,000 yuan in economic benefits; moreover, the plant has opened up the far-IR and mid-IR Fourier spectrometer special-purpose device export market, earning US$158,000 and a seal of approval by the U.S. firm Nicolet, which has found it superior to the original device and meeting current international advanced standards.

Barium-Strontium Titanate Crystal Certified

93P60136B Fuzhou FUJIAN RIBAO in Chinese 24 Dec 92 p 1

[Article by Yang Zhaoliang [2799 6856 5328]: "Barium-Strontium Titanate Developed"]

[Summary] The CAS Fujian Institute of Material Structure has realized another world state-of-the-art achievement with its development of the new photorefractive crystal barium-strontium titanate, which recently passed formal appraisal. The Fujian scientists first reported their discovery and characterization (birefringence, electro-optic coefficient, Curie point temperature, etc.) of this new material in May of last year [i.e., 1991] at a laser and optoelectronics conference held in the United States, and have since made breakthrough advances in crystal growth techniques and device fabrication.

New Advances in Soft-X-Ray Multilayer Film R&D

93P60136C Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 25 Dec 92 p 1

[Article by Yu Tang [3768 1016] and Xin Wen [6580 2429]: "Nation Realizes Breakthrough Advances in 'Soft-X-Ray Multilayer Film Technology Research'"]

[Summary] Scientists in the Applied Optics Key State Laboratory of the CAS Changchun Institute of Optics & Fine Mechanics have realized breakthrough advances in their research on soft-x-ray multilayer thin film technology—particularly in the areas of optical constant determination, film series design theory, ion-beam sputtering film-coating equipment development, film coating technique, film series periodic structure and reflectivity testing. Multilayer films fabricated by these scientists exhibit a measured reflectivity of over 20 percent in the 20-nanometer-plus band; in the 12.5-20-nanometer band, reflectivity measures over 40 percent. In addition, the scientists have had initial experience with the application of soft-x-ray lasers and soft-x-ray monochromators in multilayer thin-film fabrication.

Fluorescent Powder Obtained From Porous Si Light-Emitting Film

93P60136D Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 29 Dec 92 p 2

[Article by Zhou Yongdong [0719 0737 2639]: "Changchun Institute of Physics Obtains Fluorescent Powder From Porous Silicon Light-Emitting Film"]

[Summary] The Changchun Institute of Physics KOCVD [as published; probably typo for MOCVD, metal-organic chemical vapor deposition] group, using simple mechanical methods, has succeeded in obtaining a powdery fluorescent medium on the surface of a porous silicon light-emitting film. In the presence of an ultraviolet analysis lamp, this powder emits a beautiful yellow fluorescent light (peak wavelength near 600 nm) and does not demonstrate chemical changes when exposed in air at normal temperatures. Porous silicon is a recently studied material important for its applications in the development of nanoscale structures.

Erbium-Doped Fiber Amplifier, Sodium-Doped Fiber Optic Ring Laser Certified

93P60136E Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 29 Dec 92 p 2

[Article by Peng Dejian [1756 1795 1696]: "Fiber Amplifier, Fiber Optic Ring Laser"]

[Summary] The Ti:gem-tunable-laser-pumped Er^{3+}-doped fiber amplifier (EDFA) and Na^{3+}-doped fiber optic ring laser jointly developed by scientists in the Physics and Radio Departments at the University of Science & Technology of China and by the [CAS] Anhui Institute of Optics & Fine Mechanics passed expert appraisal in early May and mid-May, respectively. The EDFA, when pumped in the 807 nm band, yields a 1.536 μm-wavelength small-signal gain exceeding 35 dB; microwatt-level signal amplification gain is 32 dB. This device has important applications in long-range, high-speed, high-capacity fiber optic communications. In perfecting their fiber optic ring laser, the scientists used a Ti:gem tunable laser at an 830 nm wavelength to pump a 4-meter-long Na^{3+}-doped fiber optic polished ring cavity, and obtained an output laser slope efficiency of 24 percent, lasing threshold of 5 mW, and a maximum output of 5.9 mW for a 30 mW pump source. This development has applications in fiber optic communications equipment, fiber optic sensors, and laser gyros.

Quasi-CW Tunable Ti^{3+}:Al_2O_3 Laser

40100057A Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 19 No 11, Nov 92 pp 801-803

[English abstract of article by Wu Ruikun, Qiu Zhi, Liu Ye, Li Qingguo, and Deng Peishen of the Shanghai Institute of Optics and Fine Mechanics, CAS, Shanghai 201800; MS received 22 Jan 91, revised 17 Apr 91]

[Text] Experimental results are presented on Ti^{3+} sapphire quasi-CW laser pumped by internal frequency-doubled quasi-CW Nd:YAG laser in the wavelength range from 685 nm to 824 nm. Maximum output power of 293 mW has been achieved. Slope efficiency is 20 percent. Maximum single frequency output power is 240 mW at 805 nm with an overall conversion efficiency of 26 percent.

Blue Dye Laser

40100057B Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 19 No 11, Nov 92 pp 804-807

[English abstract of article by Liu Lingling of the Length Division, National Institute of Metrology, Beijing; MS received 19 Nov 90, revised 28 Feb 91]

[Text] A blue dye laser with high output power in single mode has been developed. When pump power at UV wavelength of Ar^+ laser is 4 W for all lines, output power of the dye laser is about 150 mW at 423 nm. The Ca atoms are obviously decelerated after shining the Ca atomic beams in counter-directions by the dye laser beam using the magnet field method.

New Advance in 1341.4 nm Nd:YAP Lasers

40100057C Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 19 No 11, Nov 92 pp 812-814

[English abstract of article by Shen Hongyuan, Zhou Yuping, et al. of Fujian Institute on Matter Structure, CAS, Fuzhou; MS received 11 Feb 91, revised 11 Mar 91]

[Text] New results of 1341.4 nm CW laser and pulsed laser are reported. Using Nd:YAP rods of φ8 x 138 mm and φ6.1 x 100 mm, 195.8 W CW radiation and 5.1J pulsed radiation at 1341.4 nm have been obtained with efficiencies of 1.43 percent and 2.02 percent, respectively.

Miniature Microwave Hybrid IC Series Developed

93P60138A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 23 Dec 92 p 1

[Unattributed article: "Miniature Microwave Hybrid Integrated Circuit Series," part of feature article "10 Major Electronics S&T Achievements of 1992"]

[Summary] Developed by MMEI's Institute 13, this series of 20 miniature microwave hybrid ICs includes several broadband low-noise large dynamic [range] amplifiers, a broadband voltage-controlled oscillator, and a broadband electrically tuned attenuator, among others. These hybrid ICs incorporate advanced technologies such as thin-film integrated micromachining and high-density surface mounting. The high degree of integration is suggested by the fact that these products come in an 11.4-mm-diameter TO-8 metal package. Overall performance for these hybrid ICs meets late-eighties international standards for products of like kind, and noise performance exceeds that of foreign-made products of like kind.

Domestic Superlattice Quantum Well Materials Reach Applied Stage

93P60138B Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 28 Dec 92 p 3

[Article by Liu Keli [0491 0344 7787]: "Domestic Superlattice Quantum Well Materials Reach Utilitarian Level"]

[Summary] The yield of superlattice quantum well (QW) materials developed by the CAS Institute of Semiconductors and grown via the metal-organic chemical vapor deposition (MOCVD) technique has now reached 76 percent, marking a reversal in the nation's former inability to grow low-threshold-current-density QW laser diodes and indicating the nation's entry into the applied stage of superlattice QW materials. This was learned on 14 December at a superlattice QW materials appraisal meeting held in Beijing. Realizing that ultrathin-layer materials growth techniques are basic to the fabrication of optoelectronic devices, CAS Institute of Semiconductors scientists in a research project begun in November 1991 used imported equipment and low-pressure nonferrous metal vapor deposition techniques popularized by developed countries in recent years to grow high-purity gallium arsenide with a 77K electron mobility of 120,000 cm^2/volt-second. This semiconductor material has applications in optical disks and ICs, and its price is only one-tenth that of the imported product of like kind. The CAS institute is now in negotiations with domestic and foreign clients to jointly manufacture this new material.

Breakthrough in Ultrathin-Layer Quantum Well Materials Growth Technology

93P60138C Beijing ZHONGGUO KEXUE BAO [CHINESE SCIENCE NEWS] in Chinese 29 Dec 92 p 2

[Article by Liu Maosheng [0491 5399 0524]: "Breakthrough in Domestic Ultrathin-Layer Quantum Well Materials Growth Technology"; cf. previous article]

[Summary] The CAS Institute of Semiconductors has announced a major breakthrough advance in its 863 Plan (optoelectronics area) project undertaken at the State Optoelectronics Fabrication Center: institute scientists are now able to grow GaAlAs/GaAs, a critical material in the structure of low-threshold-current-density QW laser diodes, with high repeatability. The material's purity and yield have entered the world's front ranks. Using MOCVD equipment, the scientists by late October this year [i.e., 1992] successfully and with repeatability grew GaAlAs/GaAs superlattice QW material with an interface fluctuation of a single molecular layer and a narrowest QW width of six molecular layers. Moreover, the scientists have used this material to fabricate 0.85-μm-wavelength MQW laser diodes. The appraisal experts noted that the new material's performance far exceeds the original targets specified in the 863 Plan project, and that the material's performance as well as that of the MQW laser diode fabricated with it meet early-nineties international standards.

High-Quality Superconducting C_{60} Film Developed by Beijing University

93P60159 Beijing RENMIN RIBAO in Chinese
24 Jan 93 p 1

[Article by Xiao Kai [5135 0418]: "Beijing University Develops Superconducting Film: Major Advances for Nation's C_{60} Research"]

[Summary] Beijing University's C_{60} research group scientists, who recently developed a new method for fabricating and separating high-purity C_{60} thin films [see JPRS-CST-92-022, 18 Nov 92, p 3], have now used this technique to develop a high-quality superconducting C_{60} thin film. The scientists took their high-purity C_{60} monocrystalline epitaxial thin film, which has a face-centered cubic structure, and doped it with an alkaline metal (potassium), thus producing a K-doped C_{60} monocrystalline film. This thin-film superconductor has a zero-resistance temperature of 21K, a resistance transition temperature width of 0.7K, and a measured dc critical current density exceeding 5.0×10^4 amperes/cm^2 at zero magnetic field and at a temperature of 4.7K. This development is critical for further research into and application of C_{60} superconductors.

ISDN Experimental System Developed

93P60132A Beijing ZHONGGUO DIANZI BAO [CHINA ELECTRONICS NEWS] in Chinese 23 Dec 92 p 1

[Unattributed article: "Integrated Services Digital Network Experimental System," part of feature article "10 Major Electronics S&T Achievements of 1992"]

[Summary] A single-node integrated services digital network (ISDN) experimental system has been jointly developed by MMEI's Institutes 54 and 30 and by Xidian University in Xian. This experimental system's design complies with CCITT recommendations, including a circuit switching module, a packet switching module, a 2B+D [two 64 kbps B channels plus one 16 kbps D channel] interface, a 30B+D interface, NT1 and NT2 network termination [type 1 and type 2, respectively] equipment, TEI [as published; probably misprint for TE1, subscriber terminal equipment type 1], and a terminal adaptor (TA). The system provides a variety of services including ISDN circuit switching and packet switching bearer services, analog telephone/digital telephone/videophone/fax transmission, and X.25 data communications. This is the nation's first true domestically researched and developed ISDN circuit/packet switching system complying with D channel signaling protocols; technical performance meets mid-eighties international standards.

HL-1 in Its Eighth Year of Safe Operations

93FE0227A Chengdu SICHUAN RIBAO in Chinese 17 Nov 92 p 1

[Article by Li Qiming [2621 0796 2494]]

[Text] The largest controlled nuclear fusion device designed and built by the Chinese—the HL-1—has been operated safely for 8 years since it was built in the Southwest Physics Institute of the Ministry of Nuclear Industry. It has completed 20 major experiments, leading to 400 research results, and received 130 awards from the province and ministry. The operation of HL-1 has elevated China's controlled nuclear fusion to a new level.

Controlled nuclear fusion is an enormously difficult task in the search for new energy sources. China's HL-1 was built and put into operation in September 1984 and passed the state assessment in October 1985. Since then researchers at the Southwest Physics Institute have been conducting experimental physics research on the HL-1 and improved its performance. In 1989 the device attained a plasma quality comparable to similar devices overseas, which made it capable of participating in international cooperation and competition.

After 1990, the Chinese researchers focused on leading high-tech topics in international nuclear fusion research and conducted experiments. China's nuclear fusion research was pushed to a new high. The transition from low confinement mode to high confinement mode of the plasma, and improving the plasma confinement by Ohmic discharge were exploratory topics studied by a few advanced countries in the late 1980's. The Chinese researchers increased the plasma density by a factor of 3 by using biased electrode, biased aperture and biased evacuated aperture. The confinement performance was improved substantially, allowing the transition from low confinement mode to high confinement mode. By optimizing the gas feeding method, the Ohmic confinement was improved and the plasma density was pushed to 1.08 x $10^{14}/cm^2$. High density confinement of plasma was therefore made possible.

Other major construction projects and experimental research topics included low noise electric current drive system, target pellet injection system, evacuated aperture, and the electron cyclotron resonance heating used worldwide in controlled nuclear fusion. These tasks were included in China's 863 High-Tech Program. With strong help of units here and abroad, and hard work of the research staff, these projects were all successfully completed. Some of the plasma parameters were raised by 20-30 percent, others have doubled, and results were better than anticipated.

Today China's HL-1 has more than 30 advanced tests and experimental methods, systems are available to attain the various parameters. The HL-1 has laid a good foundation for future larger facilities.

The experimental research results of HL-1 in the last 3 years have passed the assessment of an expert evaluation committee on 15 November. The committee members included Wang Ganchang [3769 3227 2490], famous nuclear scientist and member of the academic council of the Chinese Academy of Sciences, and Gou Qingquan [5384 3237 3123], famous atomic and molecular physicist and member of the academic council. The HL-1 will begin a complete engineering overhaul and the rebuilt device will have even better performance.

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